Package ‘wowa’

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Description Introduce weights into Ordered Weighted Averages and extend bivariate means based on n-
       ary tree construction. Please refer to the following:
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Description

Various weighted multivariate extensions of bivariate and OWA functions, including implicit, quantifier-based and binary tree based WOWA.

Usage

\texttt{wowa()}

Details

Lists the functions implemented in this package.

Value

No return value, called for printing only.

Author(s)

Gleb Beliakov, Daniela L. Calderon, Deakin University

References


Examples

\texttt{wowa()}

**wowa.ImplicitWOWA**

*Implicit Weighted OWA Computation Function*

**Description**

Function for Calculating implicit Weighted OWA function

**Usage**

```
wowa.ImplicitWOWA(x, p, w, n)
```

**Arguments**

- `x`: The vector of inputs
- `p`: The weights of inputs `x`
- `w`: The OWA weightings vector
- `n`: Dimension of the vector `x`

**Value**

- `output`: The value of the Implicit Weighted OWA

**Author(s)**

Gleb Beliakov, Daniela L. Calderon, Deakin University

**Examples**

```
n <- 4
example <- wowa.ImplicitWOWA(c(0.3,0.4,0.8,0.2), c(0.3,0.25,0.3,0.15), c(0.4,0.35,0.2,0.05), n)
example
```

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**wowa.OWA**

*Ordered weighted average function*

**Description**

Function for computing the ordered weighted averages

**Usage**

```
wowa.OWA(n, x, w)
```
Arguments

- `n` Dimension of the vector `x`
- `x` The vector of inputs
- `w` The OWA weights

Value

- `output` The value of the ordered weighted average.

Author(s)

Gleb Beliakov, Daniela L. Calderon, Deakin University

Examples

```r
n <- 4
wowa.OWA(n, c(0.3, 0.4, 0.8, 0.2), c(0.4, 0.35, 0.2, 0.05))
```

---

**wowa.WAM**

**WAM computation**

Description

Function for calculating the Weighted Arithmetic Mean

Usage

```r
wowa.WAM(n, x, w)
```

Arguments

- `n` Dimension of the array `x`
- `x` The vector of inputs
- `w` The vector of weights

Value

- `output` The value of the WAM function

Author(s)

Gleb Beliakov, Daniela L. Calderon, Deakin University

Examples

```r
n <- 4
wowa.WAM(n, c(0.3, 0.4, 0.8, 0.2), c(0.3, 0.25, 0.3, 0.15))
```
wowa.WAn

Extension of binary averaging

Description

Function for calculating a binary tree multivariate extension of a binary averaging function

Usage

wowa.WAn(x, w, n, Fn, L)

Arguments

x
Vector of inputs
w
The weightings vector
n
Dimension of the array x (and w)
Fn
Bivariate symmetric mean that is extended to n arguments
L
The number of levels of the binary tree (see docs)

Value

output
The output is Weighted n-variate mean extending Fn

Author(s)

Gleb Beliakov, Daniela L. Calderon, Deakin University

Examples

Fn <- function(x, y) { # just a simple arithmetic mean,
# but can be more complex functions (eg heronian, logarithmic means)
out <- (x+y)/2
return(out)
}

n <- 4
example <- wowa.WAn(c(0.3, 0.4, 0.8, 0.2), c(0.4, 0.3, 0.2, 0.1), n, Fn, 10)
example
wowa.weightedOWAQuantifier

*WOWA value computation Function*

**Description**

Function for calculating the value of the quantifier-based WOWA function

**Usage**

```r
wowa.weightedOWAQuantifier(x, p, w, n, spl)
```

**Arguments**

- **x**
  - The vector of inputs
- **p**
  - The weights of inputs x
- **w**
  - The OWA weightings vector
- **n**
  - The dimension of the array x
- **spl**
  - A structure that keeps the spline knots and coefficients computed in weightedOWAQuantifierBuild function

**Value**

- **output**
  - The output is quantifier-based WOWA value

**Author(s)**

Gleb Beliakov, Daniela L. Calderon, Deakin University

**Examples**

```r
n <- 4
pweights=c(0.3, 0.25, 0.3, 0.15);
wweights=c(0.4, 0.35, 0.2, 0.05);
tempspline <- wowa.weightedOWAQuantifierBuild(pweights, wweights, n)
wowa.weightedOWAQuantifier(c(0.3, 0.4, 0.8, 0.2), pweights, wweights, n, tempspline)
```
wowa.weightedOWAQuantifierBuild

RIM quantifier of the Weighted OWA function

Description

Function for building the RIM quantifier of the Weighted OWA function

Usage

wowa.weightedOWAQuantifierBuild(p, w, n)

Arguments

p The weights of inputs x
w The OWA weightings vector
n The dimension of the vectors p, w

Value

output A structure which has fields: spl, which keeps the spline knots and coefficients for later use in weightedOWAQuantifier, and Tnum, the number of knots in the monotone spline

Author(s)

Gleb Beliakov, Daniela L. Calderon, Deakin University

Examples

n <- 4
pweights=c(0.3,0.25,0.3,0.15);
wweights=c(0.4,0.35,0.2,0.05);
tspline <- wowa.weightedOWAQuantifierBuild(pweights, wweights, n)
wowa.weightedOWAQuantifier(c(0.3,0.4,0.8,0.2), pweights, wweights, n, tspline)

wowa.WOWATree

Weighted extension of the OWA function

Description

Function for extending order weighted averages and other multivariate symmetric functions

Usage

wowa.WOWATree(x, p, w, n, Fn, L)
Arguments

x  The vector of inputs
p  The weights of inputs x
w  The OWA weightings vector
n  The dimension of the vector x
Fn Base n-variate symmetric function defined in R
L  The number of levels of the n-ary tree (see docs)

Value

output The output is the weighted ordered weighted average.

Author(s)

Gleb Beliakov, Daniela L. Calderon, Deakin University

Examples

```r
Fn <- function(n, x, w) {
  out <- 0.0
  for(i in 1:n) out <- out + x[i] * w[i];
  #print(out)
  return(out)
}

n <- 4
example <- wowa.WOWATree(c(0.3, 0.4, 0.8, 0.2),
                          c(0.3, 0.25, 0.3, 0.15),
                          c(0.4, 0.35, 0.2, 0.05), n, Fn, 10)
example
```
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